**Cobra Invitational Microbe Mission Test**

**Station 1**

***Part 1: Identify the type of microscope based on the information provided (some may have more than one possible answer).***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Compound | Stereoscope | Confocal | SEM | TEM |

1. Uses laser light as a source of radiation for image formation.
2. Uses visible light for a source of radiation for image formation.
3. Uses a vacuum as a medium.
4. Specimens are mounted on thin films of a supporting material on copper grids.
5. Specimens are mounted on aluminum stubs and coated in gold.
6. Specimens are not mounted on anything.
7. This type of microscope has a low magnification.
8. This type of microscope uses electron illumination with a 3-D image.
9. This type of microscope uses electron illumination with a 2-D image.
10. This type of microscope gives you an image in black and white.

***Part 2: Use the microscope at the station to answer the following questions***

1. What part of the microscope is labeled “A”?
2. What part of the microscope is labeled “B”?
3. What part of the microscope is labeled “C”?
4. What part of the microscope is labeled “D”?
5. What is the total magnification of an object viewed with the yellow lens?
6. When you view one of the *Allium root tip mitosis* slides, how wide is one of the root tips in microns?
7. How many microns wide is the field of view of this microscope when viewed under 40x magnification?

***Part 3: Answer the following questions about the principles of microscopy***

1. Is resolution best when the distance separating two objects is small or large?
2. Typically, the highest magnification that a compound microscope can have is (circle one)
   1. 40X b. 100X c. 400X d. 800X e. 1000X d. There is no limit
3. Based on the numerical aperture formula, what type of light wavelength provides for better resolution, longer wavelengths or shorter wavelengths?
4. What does the term parfocal mean in microscopy?
5. What term for a lens describes the size of the smallest object that can be seen with it?
6. Why does immersion oil placed between a lens and a glass slide increase resolution?
7. As magnification increases, what happens t the size of the field of view?

**Station 2**

Fill in the blank. Please write legibly. If the answer cannot be understood it will be incorrect.

ANIMAL CELL:  
look at the diagram and identify each of the labeled parts.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

PLANT CELL:  
look at the diagram and identify each of the labeled parts.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

K. Identify two differences between a plant cell and an animal cell.

L. Identify two similarities between a plant cell and an animal cell.

**Station 3**

***Part 1: Use the two specimens under microscope A and B to complete the chart.***

Complete the chart below comparing the specific differences between prokaryotic and eukaryotic cells

|  |  |  |
| --- | --- | --- |
|  | **Prokaryotes** | **Eukaryotes** |
| Approximate size (μm) |  | 2. |
| Location of genetic material |  | 4. |
| Genetic material membrane-bound |  | 6. |
| Replication mechanism | 7. | 8. |
| Contains plasmids | 9. | 10. |

***Part 2: Answer the following questions about prokaryotes and eukaryotes.***

1. Identify if the slide under **Microscope C** is a sample of aProkaryotic or Eukaryotic cell.
2. Name an identifying characteristic of this cell.
3. Describe an advantage of having the presence of capsules in prokaryotes?
4. Which of the following correctly orders the following from largest to smallest
   1. Eukaryotes, Prokaryotes, viruses, proteins, small molecules, atoms
   2. Prokaryotes, viruses, eukaryotes, small molecules, proteins, atoms
   3. Atoms, small molecules, proteins, viruses, prokaryotes, eukaryotes
   4. Viruses, Eukaryotes, prokaryotes, atoms, small molecules, proteins
   5. None of the above

**Station 4**

**Each of the diseases is caused by a specific type of microbe.**

**On your answer page write the letter that matches each disease with its origin.**

**PLEASE DO NOT WRITE ON THIS STATION PAGE**

**PART ONE**

**B = Bacterial F = Fungal P = Protozoan V = Virus W = Parasitic Worms**

21. \_\_\_Potato blight-*early*

22. \_\_\_Rabies

23. \_\_\_Ringworm

24. \_\_\_Rubella

25. \_\_\_Schistosomiasis

26. \_\_\_Streptococcus

27. \_\_\_Tapeworm

28. \_\_\_Tetanus

29. \_\_\_Thrush

30. \_\_\_Trichinosis

11. \_\_\_Giardiasis

12. \_\_\_Hookworm

13. \_\_\_Influenza

14. \_\_\_Legionnaires

disease

15. \_\_\_Lyme disease

16. \_\_\_Malaria

17. \_\_\_Mononucleosis

18. \_\_\_MRSA

19. \_\_\_Pertussis

20. \_\_\_Polio

1. \_\_\_ Anthrax

2. \_\_\_ Athletes foot

3. \_\_\_ Botulism

4. \_\_\_ Chlamydiasis

5. \_\_\_ Cholera

6. \_\_\_ Dental disease

7. \_\_\_ Dutch Elm disease

8. \_\_\_ Ebola

9. \_\_\_ Ergotism

10. \_\_\_Estuary Associated

Syndrome

**PART TWO – Fill in the Blank** You may only use the diseases in the list above.

**NOTE:** *Spelling does count* because ***you may copy*** the accurate spelling from the list above.

Identify the disease that matches the symptoms, or antidote describe in each question.

31**.** Which common childhood disease has no specific treatment but it does have an effective preventative vaccine?

32**.**  Which disease is caused by a microbial organism that can cause hallucinations when it is eaten?

33**.** What coughing disease is more dangerous for infants that adults? There is a vaccine.

34**.** Identify one of the diseases that can be carried by mosquitoes.

35**.** What disease is caused by an organism in contaminated water?

**Station 5**

1. One example of a beneficial fungus is
2. Aspergillus oryzae
3. Ustilago maydis
4. Archaea beneficius
5. Amanita phalloides
6. This fungus is added to a mash of beans and wheat and then fermented and refined to make
7. Cheese
8. Bread
9. Soy sauce
10. Beer
11. Look at figure 1. This is an image of made using bright field microscopy. What is this an image of?
12. Algae
13. Lichens
14. Protists
15. Yeast
16. What is this substance used for?
17. Cheese
18. Bread
19. Soy sauce
20. Yogurt
21. One of the oldest methods of preserving food and preventing spoilage is \_\_\_\_\_\_.
22. Canning
23. Freezing
24. Pasteurization
25. Salting
26. This method works by \_\_\_\_\_\_\_.
27. Decreasing moisture content so mold cannot grow.
28. Killing bacteria with low temperature.
29. Killing bacteria with high temperature.
30. Adding yeast to eat the bacteria present in the food.
31. Natural unrefined salt is a haven for large and diverse populations of \_\_\_\_\_\_\_\_\_, most of which can be identified as Halobacteriaceae.
32. Archaea
33. Bacterium
34. Algae
35. Fungus
36. Look at figure 2, which is a graph showing growth rate of the two  
    primary bacteria that give sourdough bread its distinctive flavor, Lactobacillus sanfransiscensis (the sourdough bacteria) and Candida milleri (the wild yeast), by temperature (Celsius). What can be said about the growth rates? **Choose two**.
37. The yeast will not grow at lower temperature.
38. The yeast will grow more slowly at lower temperature.
39. The yeast grows more slowly the longer it sits.
40. The bacteria grow faster than the yeast at higher temperature.
41. The bacteria grow slower than the yeast at higher temperature.
42. The bacteria and yeast have similar growth rates at all temperatures.
43. Using figure 2, what is the ideal temperature for yeast growth?
44. 20°C
45. 25°C
46. 27°C
47. 30°C
48. Using figure 2, what is the ideal temperature for Lactobacillus sanfrasiscensis II growth?
49. 22°C
50. 25°C
51. 30°C
52. 32°C
53. Yeast is used to ferment foods. Fermentation is the process by which extra sugars are consumed while carbon dioxide and alcohol are emitted as byproducts from the consumption.
54. Bacteria, oxygen
55. Sugars, carbon dioxide
56. Sugars, oxygen
57. Gluten, carbon dioxide
58. The health benefits of yogurt for the most part can be directly attributed to \_\_\_\_\_\_, which are defined as a mono- or mixed culture of live microorganisms which benefits the host by improving the host’s microflora.
59. Probiotics
60. Antibiotics
61. Fermented yeast
62. Sugars
63. Common microbes added to yogurt are Lactobacillus casei and species of Bifidobacterium. List which figure, 3 or 4, is L. casei.
64. List which figure, 3 or 4, is Bifidobacterium.
65. You look at the sandwich you packed in your lunch. It looks like figure 5. This organism is most likely
66. Archaea
67. Bacterium
68. Algae
69. Fungus
70. Is it safe to eat?
71. Of course, just cut off the moldy bits.
72. No way! It can cause anything from stomache upset to death!!!

**Station 6**

***Part 1***

1. Microbes are used in the production of sausages. In particular, bacteria are used to \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Ripen the surface of the sausages
3. Develop color and flavor of the sausages
4. Shape the sausages
5. Preserve the sausages
6. Microbes are used in the production of sausages. In particular, bacteria are used to \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
7. Ripen the surface of the sausages
8. Develop color and flavor of the sausages
9. Shape the sausages
10. Preserve the sausages
11. In cheese-making, milk is first inoculated with lactic acid bacteria and **rennet**. The lactic acid bacteria convert the \_\_\_\_\_\_\_\_ to lactic acid.
12. Proteins
13. Enzymes
14. Fats
15. Sugar
16. All chickens have salmonella bacteria growing in their intestinal tract. The graph in figure 1 gives data on how long it takes to properly pasteurize chicken in order to kill the bacteria. How long does it take (in minutes) to pasteurize chicken at a temperature of 145°F?
17. What trend do you notice about this process?
18. It’s really hard to kill salmonella
19. Salmonella thrive in high temperatures
20. The hotter you get, the faster bacteria die
21. Salmonella only die at low temperatures
22. Pickling is a traditional method of preserving food. In chemical pickling, the food is placed in an edible liquid that inhibits or kills bacteria and other micro-organisms. Typical pickling agents include **(choose three)**
23. Brine (salty water)
24. Fresh water
25. Coffee
26. Vinegar
27. Vegetable oil
28. Milk
29. Sodium hydroxide (lye) makes food too \_\_\_\_\_\_ for bacterial growth. Lye will saponify fats in the food, which will change its flavor and texture. Lutefisk uses lye in its preparation, as do some olive recipes.
30. Alkaline
31. Basic
32. Salty
33. Watery
34. A microbe that is harmful to humans is called \_\_\_\_\_\_\_\_\_.
35. A bad microbe
36. A pathogen
37. A eukaryotic microbe
38. A moratorium

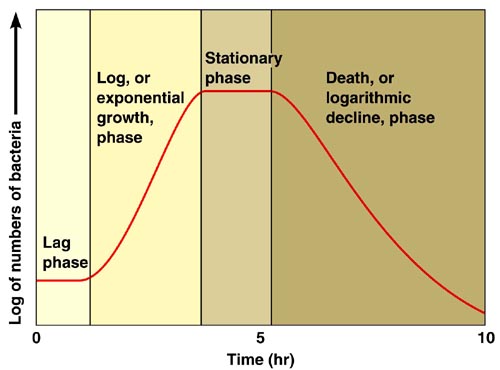
***Part 2***

Sort the following microbes into the categories of Harmful and Beneficial in relation to humans. Put an **H** next to the harmful microbes. Put a **B** next to the beneficial microbes.

1. Vaccinia virus
2. Streptococcus thermophilus
3. Nesisseria meningitidis
4. Streptococcus pneumoniae
5. Streptomyces coelicolor
6. Flavivirus
7. Candida

**Station 7**

**PLEASE DO NOT WRITE ON THIS GRAPH**



**#1**

**#3**

**#4**

**#2**

Remember to place your answers in the correct place.

1. A. Identify this phase of bacterial growth.

**B & C** give two (2) characteristics specific to this phase

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**B & C** give two (2) characteristics specific to this phase

1. Population size does not increase during \_\_\_\_ phase?
2. During which phase is the growth most suseptable to adverse environmental conditions?
3. During which phase do the cells lose their ability to divide.